

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 07-018165

(43)Date of publication of application : 20.01.1995

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(51)Int.Cl.

C08L 67/02  
C08K 3/34  
C08K 7/02  
//(C08L 67/02  
C08L 25:18 )

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(21)Application number : 05-161367

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(22)Date of filing : 30.06.1993

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## (54) FLAME-RETARDANT POLYESTER RESIN COMPOSITION

### (57)Abstract:

PURPOSE: To obtain a flame-retardant polyester resin composition which can be optimally used as a molding material for thinwalled small-size parts and can be injected with reduced pressure as a sealing material for coil bobbins because of its reduced viscosity.

CONSTITUTION: This flame-retardant polyester resin composition is essentially composed of 100 pts.wt. of polyester resin, 10 to 60 pts.wt. of brominated polystyrene of which more than 20wt.% is the brominated polystyrene of 1,000 to 18,000 weight-average molecular weight.

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## LEGAL STATUS

[Date of request for examination] 28.06.2000

[Date of sending the examiner's decision of rejection] 08.06.2001

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

#### [0001]

[Industrial Application] This invention relates to the fire-resistant polyester resin constituent of hypoviscosity suitable as a sealing agent the optimal as a molding material of light-gage and small components.

#### [0002]

[Description of the Prior Art] Conventionally, using bromination polystyrene as a flame retarder of polyester is known widely.

[0003] However, the fire-resistant polyester resin constituent containing conventional bromination polystyrene (120,000 or more weight average molecular weight) has high viscosity, and it is not enough as a molding material of light-gage and small components. Moreover, if the fire-resistant polyester resin constituent which contained conventional bromination polystyrene as sealing agents, such as a coil bobbin, is used, the non-filling section will arise in low injection pressure, and if the usual injection pressure is used, the problem that deformation and cutting of a magnet wire occur will arise.

#### [0004]

[Problem(s) to be Solved by the Invention] This invention cancels the conventional fault mentioned above, and aims at offering the fire-resistant polyester resin constituent of the hypoviscosity in which low voltage injection is possible as sealing agents, such as a coil bobbin, the optimal as a molding material of light-gage and small components.

#### [0005]

[Means for Solving the Problem] This invention which attains the above-mentioned purpose is in the fire-resistant polyester resin constituent which essentially consists of the polyester resin 100 weight section, and bromination polystyrene 10 - 60 weight sections, and is characterized by 20% of the weight or more of the bromination polystyrene concerned being bromination polystyrene of weight average molecular weight 1,000-18,000.

[0006] The polyester resin used for this invention is polyalkylene terephthalate preferably, and polyethylene terephthalate especially preferably. As for polyethylene terephthalate, it is desirable to use what has about 0.4 intrinsic viscosity at least at 30 degrees C among the methylene chloride of a volume ratio 3:1 and trifluoroacetic acid, and it is desirable to use what has the intrinsic viscosity to about 1.2.

[0007] Although well-known bromination polystyrene, such as for example, poly dibromo styrene, PORITORI bromostyrene, and the poly PENTA bromostyrene, can be used for the bromination polystyrene used for this invention, the content is 10 - 60 weight section to the polyester resin 100 weight section, and 20% of the weight or more of the bromination polystyrene to contain is weight average molecular weight 1,000-18,000. Weight average molecular weight is measured with gel permeation chromatography (GPC) using chloroform. If there are few contents of bromination polystyrene than 10 weight sections, fire retardancy will not be set to V-0 (UL94), but when [ than 60 weight sections ] more, a mechanical property is made to fall, and it is not desirable. Moreover, if there are few contents of the bromination polystyrene of weight average molecular weight 1,000-18,000 to the whole bromination polystyrene than 20 % of the weight, viscosity cannot attain the purpose of this invention highly. As for the suitable mixing ratio of 18,000 or more bromination polystyrene and the bromination polystyrene of 1,000-18,000, weight average molecular weight is decided according to an application. Although the viscosity of a polyester resin constituent will become low if many bromination polystyrene of low molecular weight is mixed, the bromination polystyrene of low molecular weight tends to have a bad influence on the mechanical property of polyester resin rather than the bromination polystyrene of the amount of giant molecules. Therefore, according to an application, a mixing ratio is specifically determined in consideration of the balance of viscosity and a mechanical property.

[0008] 1-200 weight section combination of the fillers, such as a glass fiber contained in the constituent of this

invention, a mica, a whisker, and plastic fiber, can be carried out to the mixture 100 weight section of polyester resin and bromination polystyrene.

[0009] Furthermore, as for the polyester resin constituent, especially polyethylene terephthalate constituent of this invention, it is desirable to contain a nucleating additive in order to raise a low-temperature metal mold moldability. A sodium compound and/or a potassium compound can be used as a nucleating additive. Some or all of these sodium compounds and/or a potassium compound may be replaced with talc. In addition, various kinds of nucleating additives can also be used. Moreover, an end may replace some or all of polyester that is the principal components of this invention with sodium or the potassium-ized polyethylene terephthalate. This polyethylene terephthalate that carried out end processing is indicated by the U.S. Pat. No. 4,425,470 specification, and can be manufactured by the approach of a publication on these specifications. If this end sodium or potassium-ized polyethylene terephthalate is used, it may be necessary to add a nucleating additive independently.

[0010] Moreover, in addition to said component, additives, such as a thermostabilizer, a plasticizer, an antioxidant, a color, a pigment, and a release agent, can be blended with the polyester resin constituent of this invention with extent which does not spoil the property.

[0011] In order to manufacture the polyester resin constituent of this invention, the approach of carrying out melting kneading is used, and kneading equipments, such as a Banbury mixer currently generally used, an extruder, and various kinds of kneaders, can be used. Moreover, about the kneading sequence at the time of manufacturing the polyester resin constituent of this invention, each component may be kneaded at once and a filler may be supplied from a side feeder.

[0012]

[Function] In this invention, since it replaces with conventional bromination polystyrene and the bromination polystyrene of low molecular weight is used, taking a mechanical property into consideration, the viscosity of the whole polyester resin can be lowered and it can consider as the fire-resistant polyester resin constituent in which low voltage injection is possible as a sealing agent the optimal as a molding material of light-gage and small components.

[0013]

[Example] Although the following examples and examples of a comparison explain this invention to a detail further, this invention is not limited only to these examples.

[0014] The constituent of the examples 1-4 containing a component as shown in the next table 1, and the example 1 of a comparison was adjusted, and the measurement result of a physical-properties value as shown in this table was obtained.

[0015]

[Table 1]

	実施例 1	実施例 2	実施例 3	実施例 4	比較例 1
P E T (%)	46.0	46.0	46.0	46.0	46.0
重量平均分子量15～17万 ポリトリクロモスチレン (%)	11.0	7.0	3.0	0	14.0
重量平均分子量 1,000～15,000 ポリトリクロモスチレン (%)	3.0	7.0	11.0	14.0	0
ガラス (%)	30.0	30.0	30.0	30.0	30.0
引張り強度 (kg/cm <sup>2</sup> )	1290	1130	1020	941	1330
伸び (%)	1.81	1.51	1.39	1.34	2.01
曲げ弾性率 (kg/mm <sup>2</sup> )	1047	1038	1041	948	1082
曲げ強さ (kg/mm <sup>2</sup> )	18.9	16.3	14.7	13.4	20.1
ノック付アイソックト衝撃値 (kg·cm/cm)	7.1	5.9	5.6	5.4	8.0
乾燥時標準溶融粘度 (Pascal·sec)	162	135	107	85.5	195
滞留時溶融粘度 (Pascal·sec)	85.7	67.2	54.3	52.5	92.2
滞留時溶融粘度保持率 (%)	52.9	49.8	50.7	61.4	47.3
燃焼性	V-0	V-0	V-0	V-0	V-0

[0016] The following component was used in these examples and the example of a comparison. Polyethylene terephthalate (PET) is the Du Pont thing, and intrinsic viscosity is about 0.67-0.58. The PORITORI bromostyrene (PAIRO check 68 by the ferro company PB) of weight average molecular weight 150,000-170,000 was used as bromination polystyrene of the amount of giant molecules. The PORITORI bromostyrene (PAIRO check LM by the ferro company) of weight average molecular weight 1,000-18,000 was used as bromination polystyrene of low molecular weight.

[0017] Du Pont Surlyn 8920 was used as the heteroatom agent. In the class product sample, the plasticizer and the antioxidant were also added further.

[0018] After carrying out preliminary mixing of the resin of the weight section shown in Table 1, a nucleating additive, and the other additives for 20 minutes with a tumbler, melting kneading was carried out at the temperature of 290

degrees C using 2 shaft extruder TEM by Toshiba Machine Co., Ltd.35B, and the resin constituent was obtained. Melt viscosity was measured using the KYAPI log rough made from an Oriental energy machine to these resin constituents. The moisture regain of standard melt viscosity is the thing of the melt viscosity in a shear rate 1216 (sec-1) here using 0.02% or less of pellet in resin temperature [ of 280 degrees C ], and residence-time 3 minutes at the time of desiccation. Moisture regain of melt viscosity is the thing of the melt viscosity in a shear rate 1216 (sec-1) using 0.02% or less of pellet in resin temperature [ of 280 degrees C ], and residence-time 30 minutes at the time of stagnation. Melt viscosity retention is called for by the following formulas at the time of stagnation.

[0019]

[Equation 1]

[REDACTED]  
It is melt viscosity at the time of melt viscosity retention (%) = $(A/B) \times 100$ A= stagnation at the time of stagnation. After drying this resin constituent at 135 degrees C about a standard melt viscosity physical-properties trial for 3 hours at the time of B= desiccation, the standard physical-properties test piece was produced with 290 degrees C and the die temperature of 110 degrees C to the polyethylene terephthalate constituent using the making machine, and the mechanical property at the time of desiccation of this resin constituent was measured. In the test method, the tensile test performed the bending test based on ASTM-790 based on ASTM-638. The Izod impact test was based on D-256. Furthermore, flammability uses a test piece with a thickness of 1/32 inch (about 0.8mm), and is UL. It measured based on 94.

[0020] Each example has low melt viscosity to the example of a comparison. Therefore, it is clear by containing the PORITORI bromostyrene of low molecular weight that melt viscosity becomes low.

[0021] While melt viscosity becomes small, an example shows that a mechanical property becomes low, as the content of the PORITORI bromostyrene of low molecular weight increases. Therefore, according to an application, loadings will be suitably determined in consideration of the balance of a mechanical property and viscosity.

[0022] Moreover, it turns out that melting stability is also improving to the value of the example of a comparison.

[0023]

[Effect of the Invention] As explained above, since the polyester resin constituent of this invention carries out specified quantity addition of the low-molecular-weight bromination polystyrene of weight average molecular weight 1,00-18,000, it is fire-resistant polyester resin constituent optimal as a molding material of light-gage and small components in which low voltage injection is possible as a sealing agent in hypoviscosity.

[0024] Since the polyester resin constituent of this invention has high melting stability, at the time of shaping, it is hard coming to generate a burr and it can obtain outstanding mold goods also with little dispersion in a dimension and weight with a good and appearance further again.

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## CLAIMS

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## [Claim(s)]

[Claim 1] The fire-resistant polyester resin constituent which essentially consists of the polyester resin 100 weight section, and bromination polystyrene 10 - 60 weight sections, and is characterized by 20% of the weight or more of the bromination polystyrene concerned being bromination polystyrene of weight average molecular weight 1,000-18,000.  
[Claim 2] The fire-resistant polyester resin constituent characterized by carrying out 1-200 weight section content of the filler at the polyester resin constituent 100 weight section according to claim 1.

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[Translation done.]